



CHEETAL

JOURNAL OF

The Wildlife Preservation Society of India

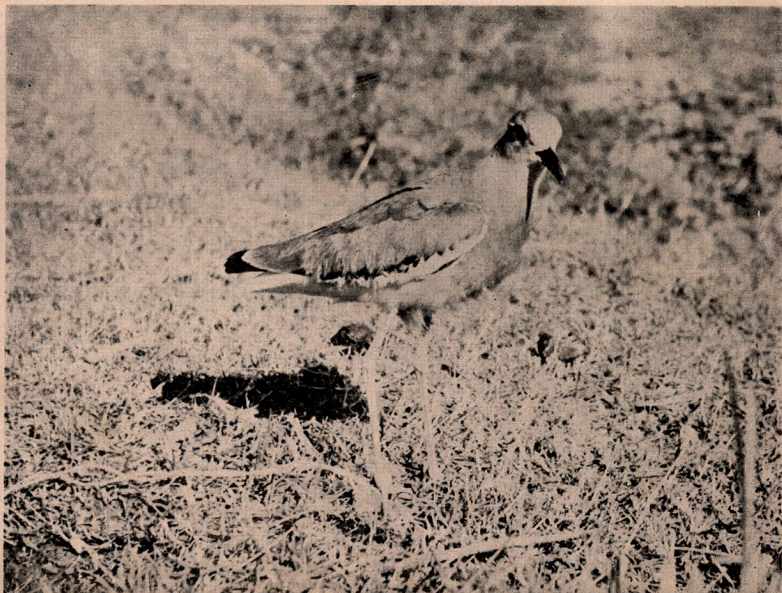
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No. 4

WHITE TAILED LAPWING (*Vanellus leucurus*)

—Photo by V.S. Saxena





Wild Buffalo of Panna.

Photo by — S.M. Hasan

(See Article on Page 29)

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Honorary Secretary.

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President's Speech on the 21st AG (Business) Meeting of The WLPSI held on Sunday, the 22nd April, 1979 at the Society's Office (7, Astley Hall) Dehra Dun at 11.30 A.M.

It gives me great pleasure to welcome you all to the 21st Annual General Meeting of the Society.

That the Society continues to be in the red is clear from the audit report for 1978-79. It needs the advice, co-operation and support of all to establish the Society on a firm footing. No society can function on membership alone and therefore all-out efforts are needed to secure more donations and endowment funds which I hope with the efforts of all of us we will be able to do in not too long a time. The Society is an Institution of National Importance and so needs to be firmly established. The Society is grateful to the donors who helped us buy the premises and give the Society a home.

The discontinuation of the recurring grant of Rs. 5,000/- per year as subsidy for publishing "Cheetal" by the Ministry of Tourism during the year has been a setback but we are trying to get some grants and may succeed. Only a few months have passed when we last met. The International Symposium on Tiger held by the Government of India at Delhi in February at which the Society was well represented was a success as it focussed attention on conservation of the Tiger.

Representatives of countries where the Tiger is found held the opinion that 'tiger is safe, it was never safer than now' but many thought that the situation was different. There is no doubt that valiant efforts are being made to save the Tiger from extinction and we hope they will succeed.

The measure of success that we have achieved in focussing attention on preservation of Wildlife could not have been achieved but for the whole-hearted co-operation and team work of the honorary office bearers and the staff and last but not the least the members of the Society to whom I am very grateful.

*Bird Study in India: Its History and Importance

DR. SALIM ALI

I feel deeply honoured at being invited by the Indian Council for Cultural Relations to deliver this annual Azad Memorial Lecture for 1978. At the same time I feel rather overawed when I look over the formidable list of my eminent predecessors in the series, and the learned topics on which they had discoursed. However, though I cannot vie with them in profundity I can perhaps try to tell you something about the subject that has continued to fascinate me through a long life of bird watching, but which has eluded a deeper and more general interest in the public because of its allegedly elitist nature, and may be also because of its relevance to human life being not so patently obvious. Since this lecture is in memory of a great man whose learning and scholarship, no less than his humanism and statesmanship have left such an indelible mark on our culture and nationalism, I may be permitted to begin with a personal digression. In the year 1948 when I happened to be engaged on a field survey of the bird fauna of the erstwhile Orissa States comprising the Eastern States Agency, I received a lunch invitation from Mr. Asif Ali, the then Governor of the State, to meet Maulana Sahab, then the Union Minister for Education, who was visiting Cuttack on tour. I was delighted at the prospect because shortly before this I had been reading in camp with much delectation and many a chuckle Maulana Azad's inimitable essay 'Chiray Chirya ki Kahani' in his admirable Urdu classic *Ghubar-e-Khatir* written during his long incarceration in Ahmadnagar gaol which began on 9 August 1942 as aftermath of the 'Quit India' resolution passed by the Indian National Congress under his Presidentship. As many here today may know, the narrative concerns a pair of House Sparrows who had made up their minds, as determinedly as only House Sparrows can to build their nest in a hole above the Maulana's bed in his prison room. The pair worked assiduously all day long bringing in straws and rubbish and attempting to stuff it into the selected hole, but succeeded only in dropping most of the litter on to the bed below. When, after several days, the birds remained undeterred by the active retaliatory measures the owner of the bed took to dissuade and dislodge them—not all perhaps strictly non-violent by text-book definition—he was finally compelled to admit defeat. Thereafter he adopted a different policy, one of friendly appeasement, and by patience and perseverance succeeded to such an extent that he actually got the birds, and others of the jail sparrow community (not the other jail birds!) even to perch on his shoulder and to peck grain from his palm. This intimate familiarity fanned his interest in the sparrows and prompted him to record his penetrating observations on the temperament, idiosyncracies, social behaviour and marital relations of each individual

*Azad Memorial Lecture 1978, Published by courtesy of Indian Council for Cultural Relations, Ministry of External Affairs, Government of India.

with an insight that would do justice to a trained naturalist. He classified different individuals according to their various qualities, and the humour and incisiveness of the descriptions with the chasteness of his Urdu diction eruditely interlarded with appropriate Persian couplets reeled off from a prodigious memory make them a rare treat to read. For example, one of his more bouncing visitors he distinguishes by the name of 'Mulla' and puckishly describes his qualifications as 'argumentative, garrulous, quarrelsome, and one who managed to elbow himself to precedence over newcomers and sermonized (chirped) from on high (an elevated perch)'. Then, in the same puckish strain he asks "What other name could be given to such a character?"

In describing the nest-feeding activities of the parent birds in his prison cell, the Maulana quotes the findings of 'an ornithologist' on the average number of daily visits a pair of sparrows makes with food for the nestlings. When I first read the account I liked to recognise that ornithologist as myself, and to think that the information may have been culled from my own *Book of Indian Birds*. Talking to his personal secretary at this Cuttack meeting years later, I learnt that my surmise was indeed correct. He had got his statement out of a copy of the above book lent him in Ahmadnagar Fort by his fellow-prisoner Jawaharlal Nehru—himself a keen bird student and nature lover! I am happy to recall that lunch meeting with Maulana Saheb in the context of today's lecture, the pleasant conversation we then had about birds, and the lively interest he showed in the subject. But to come to my thesis. Perhaps a brief historical review of bird study in India from ancient times up to the present may help to provide a correct perspective. I am not aware of any ancient treatises on Indian birds, as such, which describe their attributes and external characters in sufficient detail to permit their identification with certainty, except perhaps in the case of the commoner species that figures prominently in mythology, legend or folklore—such as crow, parakeet, koel, peacock, and some others. In any case a direct assessment of their worth as 'scientific' text would be beyond me since I am no scholar of Sanskrit or Pali. However, the English translation of the Sanskrit text of a book *Mrign-Pakshi-Sastra* or 'Science of Birds and Animals' by Hamsadeva, said to be a Jain author of the 13th century A.D.—the only work of this kind known to my friend Shri Harinarayan Acharya of Ahmedabad, himself an erudite Sanskrit scholar and a competent ornithologist—is not impressive. Its bizarre descriptions, often comically vague and amusing, perhaps rendered more so by the translator's special brand of English, are not very revealing. For example, what is ostensibly meant to be the Saras Crane is described as follows: "They are very tall, having long legs, red beaks and white bodies. Their stomachs and rear portions are stout. Their wings are broad and big. They are a little impatient when they are hungry. They eat small fish, fruits, lotus trunks and roots and others. They often dive in water and play. They generally enjoy during nights. They fly in the sky with their couples. They perch on the cool trees at the time of wearisome-*sic*. They are much afraid of the roar of lions and tigers and they run

away to distant places. They are fond of swimming even in the floods and they have smooth feathers. They have a little passion."

The other sources of information regarding Indian birds of the pre-Moghul period are the several lexicons of Sanskrit words, though these are not very helpful in identifying the species either. Some names are based on calls, i.e. they are onomatopoeic like *Kaka* for the crow (which says 'ka..ka'); others are based on colourations, habits, gait, method of feeding, and so on. Some names are identifiable easily enough, while others are obscure. Perhaps the only person who has attempted to identify birds from such Sanskrit names was the late Dr. Raghuvira in his publication *Indian Scientific Nomenclature of the birds of India, Burma and Ceylon*, 1949. With varying—often dubious—success he identifies some 250 Sanskrit words with known species of Indian birds. Some of his conclusions, however, are distinctly far-fetched! Classical Sanskrit literature occasionally makes specific mention of Bird Migration, as for example the migration of geese (*hamsa*)—wrongly rendered as 'swans' by many commentators—to lake Manasa (Manasarovar). The poet Kalidasa, a close observer of bird behaviour—described the migratory habits of two species of geese, *Raja-hamsa* (Barheaded) and *Kadamba* (Greylag) as accompanying the rain clouds on their way from the Vindhya to the Himalayas.

The Indian Koel and its habit of brood-parasitism was well known to the Vedic seers, and described unambiguously in Sanskrit literature. Interestingly enough this appears also to be the earliest record of avian brood-parasitism, since it was described many centuries before Aristotle (384-322 B.C.) or his immediate colleagues or predecessors began to write about the European Cuckoo.

The Moghul Emperors, at least from Babur to Shah Jahan, were renowned aesthetes and lovers of Nature in all its forms. Among them the two most outstanding naturalists were Babur and his great-grandson Jahangir. Some of the accounts they have left behind of the habits and behaviour of the birds that came under their personal observation are so apt that they could scarcely be bettered for incisiveness and scientific accuracy today. What is more creditable about these royal naturalists is that they do not rely on mere hearsay but make a clear distinction in their writings between their personal observations and what has been reported to them by others. For instance, while describing the Monal Pheasant, Babur writes with subtle humour "A remarkable circumstance is told of them. It is said that in winter they come down to the skirts of the hills, and if in their flight one of them happens to pass over a vineyard he can no longer fly and is taken." He then continues "God knows the truth. Its flesh is very savoury." Mark here the clear distinction between what God knows and what the Emperor can personally testify!

The outstanding features of Jahangir's character were his love of Nature and his powers of observation. It has been rightly said of him that had he been head of a 'Natural' History

museum he would have been a better and happier man. His *Memoirs* are replete with observations on birds and other animals written with an accuracy and insight that would do credit to a modern student of bird behaviour and ecology. He has, for instance, some extremely useful and interesting notes on the breeding habits of the Saras Crane from the time of their pairing onward and till the eggs were hatched, that are in complete accord with present day knowledge. Jahangir established and patronized a school of animal painting at his court headed by the famous Ustad Mansur, honoured by the Emperor with the title of Nadir-ul-Asr. Whenever an unfamiliar or exotic bird or beast was brought to him, Jahangir first studied it carefully for its characteristics before describing it in his *Memoirs*. Immediately thereafter he caused it to be painted by Ustad Mansur or one of his school to serve as supporting illustration. Since the Emperor's reputation as a lover of birds and animals had spread far and wide throughout the world, foreign emissaries accredited to the Moghul court vied with one another to bring him as *nazar* or *peshekash* the strangest and rarest birds and beasts from their respective countries for the Imperial menagerie. In this way was built up the unique collection of exquisite animal portraits which, on the disintegration of the Moghul Empire gradually got scattered and, largely through loot and skulduggery, found its way to unexpected and far-flung corners of the earth. Among the bird portraits attributed to Ustad Mansur, but which is certainly the handiwork of one of his school and period, is a painting of a Siberian or Great white Crane. At the present time this crane is one of our rarest and most endangered species with a total world population of perhaps no more than 250 individuals. A significant section of this population, 70 birds or so, visits the Keoladeo Ghana Bird Sanctuary of Bharatpur every winter between November and March to add to the glory of this priceless natural wetland. The interesting point about this painting—fortunately still in the collection of the Indian Museum, Calcutta—is that it was executed between the years 1616 and 1620 A.D. and thus nearly 160 years before the bird was actually 'discovered' and described for western science (in 1773) by the Russian zoologist Pallas from the swamps bordering the Obe and Irtysh rivers in USSR! Another bird painting, a miniature, of Jahangir's period and though unsigned and undated clearly of the Mansur school has the unique distinction of being one of the only two drawings ever made from life of the Mauritius Dodo (*Raphus cucullatus* L.) which became extinct in 1681. The portrait is considered by experts to be the most scientifically accurate one in existence of that flightless pigeon-like bird which first became known to Europeans in 1598 and was so completely exterminated in less than a hundred years by the hungry sailors of visiting ships and the rats and domestic animals introduced by them on the island. This remarkable painting had lain in oblivion in the Institute of Orientalistics of the USSR Academy of Sciences until stumbled upon by Dr. A. Ivanov of the Leningrad Zoological Museum. He brought it to the notice of ornithologists gathered in Helsinki for the 12th International Ornithological Congress in 1958 and caused quite a sensation. Strangely enough, and contrary to his usual practice, there is no

mention of the dodo in Jahangir's Memoirs, and whence and how the living specimen came to be available for painting seems a mystery. A plausible explanation has been suggested by me elsewhere (in Alvi, M.A. & A. Rahman 1967, *Jahangir the Naturalist*). Jahangir's Memoirs ended in 1624, three years before his death. The dodo must have come into Jahangir's possession and been painted during the blank period and hence it unfortunately finds no mention in the chronicle. It is on record that two live specimens of the Mauritius Dodo were kept at the East India Co.'s factory in Surat where the chronicler, Peter Mundy first saw and described them in 1628, i.e. 11 months after Jahangir died. It seems more than likely that the miniature represents one of these same birds. Or it could even be that there was a third bird in this batch which had been presented to Jahangir by the Surat factory before his death as an ingratiatory gesture, knowing the Emperor's passion for strange and exotic creatures.

Foreign adventurers and travellers to India in the closing years of the Moghul Empire, towards the end of the 18th century and the beginning of the 19th, had carried back with them as novelties from time to time to various European museums small collections of the skins and eggs of Indian birds. Sporadic collections had also been assembled by servants of the East India Company for its own museum in Calcutta in various newly purloined territories of the insidiously expanding British Indian Empire. But scientific ornithology, more or less as understood today may, for practical purposes, be said to commence with the publication of the two volumes of Jerdon's classic *Birds of India* between 1862 and 1864. In this work the author bestowed an English name on all the birds of India largely based on British analogies. While many of them are reasonably appropriate, others have gone through numerous attempted improvements by successive authors. It is to be hoped that English nomenclature has at last attained near-stability with the latest publication, the 10-volume Handbook of the *Birds of India and Pakistan* by Salim Ali and S. Dillon Ripley, 1968-73. The standardization of vernacular bird names for all-India use still remains an urgent need in order to satisfy the demand for popular bird books in the regional languages.

One of the earliest of the 'modern' accounts of Indian birds was actually published in 1713 by Edward Buckley, an East India Company surgeon in Madras, with descriptions and drawings of 22 birds found in and about Fort St. George. Several other bird collectors and writers followed during the rest of the century, many of whom have left their mark on Indian ornithology either by describing newly discovered birds, or having such novelties named after them, and in other ways. The first serious attempt at recording the avifauna of a definitive region in India in a scientific journal (*Proc. Zool. Soc., London*) was a paper in 1831 by a Capt. James Franklin, a geologist who had undertaken expeditions in the Central and United Provinces to study the rocks in the Vindhyan Hills, and incidentally to collect

birds for the Asiatic Society. He collected some 200 birds of 156 species, of which 30 he described as new.

Among the early writers on Indian birds before the publication of Jerdon's *Birds of India* another specially notable one was Col. W.H. Sykes who came out to India in 1803 aged 13, and, believe it or not, received a commission in the Bombay Army. He saw a great deal of service in the Mahratta wars, and collected birds in the Bombay Deccan. His well-known paper 'A Catalogue of the Birds of the Deccan' was published in the *Proceedings of the Zoological Society, London* in 1832. He described a number of new species many of which he named after Hindu deities such as *Mityus govinda* for the Pariah Kite, *Hippolais rama* for a Tree Warbler, *Patrocinchla pandoo* for the Blue Rock Thrush, *Hypsipetes ganeesa* (after Ganesh) for the Southern Black Bulbul, and others. There were several other similarly active field workers, mostly civil or military officials, in the employ of the E.I.Co. scattered widely over different parts of the country during the first six decades of the 19th century. But the period was dominated by the virtual Founders of Indian ornithology, namely Brian Houghton Hodgson, (first assistant British Resident and later Resident, at the court of Nepal between 180 and 1844), Edward Blyth the Curator of the Asiatic Society of Bengal's museum, Calcutta from 1841-62—whose writings did more for the extension of natural history studies in India than any other—and Thomas Caverhill Jerdon, a surgeon in the Madras Army of the East India Co.'s establishment. John Gould, the taxidermist of the Zoological Society, London, was the first to make known birds from the Himalayas from a small collection of skins he had acquired between 1825 and 1830. Most of the birds were new and Mrs. Gould made drawings of them which were described by N.A. Vigors and published in *A Century of Birds from the Himalayan Mountains* in 1832. In 1849 Gould commenced a sumptuous elephant folio work of coloured lithographs, *Birds of Asia*, but died before it was completed, and Dr. Bowdler Sharpe was responsible for the 7th (final) volume which came out in 1883.

Jerdon's *Birds of India* epitomizes the knowledge up to that period based largely upon the publications of these and several other illustrious field naturalists, and on the vast collections of skins made by them and their numerous correspondents and proteges scattered over the Company's territories. In the latter part of the 18th century, and even till well into the 19th, taxidermy was still in its infancy, and instead of making a collection of stuffed skins it was the custom in India to employ local artists to make paintings of birds. The tradition of life-like animal portraiture set by the Jahangir school was still very much alive. Many collections of bird paintings were thus made, e.g. those of General Hardwicke had Francis Buchanan-Hamilton, and some of them became famous because of the many new species that were described on their basis in lieu of actual skins. In 1844 Jerdon himself and published a selection of 50 lithographs with descriptive letterpress entitled *Illustrations of Indian Ornithology*. The originals of these were drawn by Indian artists, and half the number

were also lithographed and painted in Madras. It was noted at the time that 'Their excellence and the faithfulness of the drawings has been universally allowed.'

The publication of *Birds of India* at once gave a marked impetus to bird study in the country, but was still almost entirely restricted to Europeans. It found new devotees among British officials, planters and professional men some of whom in turn were soon to become prominent names in Indian ornithology. The period thence, and right up to the publication of the first edition of the Bird volumes of the India Office sponsored. *Fauna of British India* series by Oates and Blandford, was completely dominated by that extraordinary personality, Allan Octavian Hume who had meanwhile appeared on the scene. Apart from his other great intellectual and humanitarian qualifications Hume's special claim to be remembered in India lies also in the fact that he was one of the original founders of the Indian National Congress, and this while still in the civil service of the Government of British India. He has, with good justification, been called 'The Father'—and by those who were irked by his occasional dogmatism 'The Pope'—of Indian ornithology. He collected methodically and intensively, himself as well as with the help of his numerous correspondents and proteges widely dispersed over the country, chiefly between the years 1870 and 1885, and thus brought together a collection that has doubtfully ever been equalled in magnitude in any branch of zoology or botany. It totalled some 60,000 skins of birds, in addition to a very large number of nests and over 16,000 eggs, all of which he later presented to the British Museum. Hume founded and edited a journal of Indian ornithology with the somewhat eccentric title of *Stray Feathers* between 1872 and 1888. Its 11 volumes containing papers by some of the more upcoming ornithologists of the time, written under his energetic guidance, and much of it by himself, are a veritable gold mine for the ornithologist and an eloquent memorial to the zeal, erudition and versatility of their remarkable editor. In *Stray Feathers* Hume has described a large number of novelties discovered during the period, and this work is indispensable for any serious study of Indian birds.

Hume was a facile and prolific writer and his pungent criticisms of contemporary ornithologists and ornithological trends and his *experto crade* pronouncements on bureaucrats and their inanities, are often amusingly interlarded with puckish humour. His account of the hare-brained introduction "by our beneficent Government anxious to succour its suffering people from rats" on some of the inhabited islands in the Laccadive (Lakshadweep) group, and the fate of "a lot of snakes and mongooses" that had first been sent down to deal with the rodents followed by a lot of Wood Owls when the latter took to the coconut trees for escape, and in turn the doom of these unfortunate owls cast upon unforested coral shores in totally incompatible ecological conditions and under strong superstitious objection from the islanders. "Unfortunately" continues Hume slyly, "as is too commonly the case in India, popular prejudice interfered to mar the success of a paternal Government's beneficent

schemes". In upshot the birds soon came to an end but not the rats! The account is too long to be quoted here in all its amusing details, but to any one who is interested in Hume or in Indian birds, or even in convincing himself that bureaucracy hasn't changed, I would strongly recommend a reference to volume 4 of *Stray Feathers* (pp. 433-4).

When *Stray Feathers* ceased publication, in 1889, most of its former contributors as well as other workers who had come into prominence meanwhile, diverted their writings to *The Ibis*, the journal of the British Ornithologists' Union and to the *Journal of the Bombay Natural History Society*. The last, which made its debut in 1886 has maintained unbroken publication since then. It is now in its 75th volume and has become increasingly important in disseminating knowledge of Indian birds. It enjoys considerable scientific prestige internationally and is recognized as the foremost natural history publication in Asia. Indian ornithology received its second definitive boost after Jerdon by the publication between 1889 and 1898 of the 4 volumes on birds by Eugene W. Oates and W.T. Blanford in the *Fauna of British India* series. Like its predecessor this work brought together, and up to date, all the advances in knowledge resulting from the extensive researches done in field and museum during the intervening 27 years. This renewed filip was clearly responsible for producing the rash of outstanding field ornithologists that distinguished the next 33 years up to the publication of Vol. 1 of the second edition of the *Fauna of British India* series on Birds—the New Fauna for short—by E.C. Stuart Baker, himself an illustrious product of that period.

The six main volumes of the *New Fauna* were completed in 1930. They in turn showed up many lacunae in our knowledge, especially concerning the areas in the subcontinent imperfectly explored or not at all, such as the Eastern Ghats and the territories of many of the princely states. This generated a series of regional ornithological field surveys organised or sponsored by the Bombay Natural History Society, which resulted in significant advances in our knowledge of the ecology, systematics and distribution of Indian birds.

A feature of the years, particularly between the two World Wars and since the end of the Second, is the increased emphasis on bird watching and ecological study in India as distinct from specimen collecting. This has been facilitated, among other things, by the availability of well illustrated books on Indian birds for identification in the field and by the great improvement in technology and optics—in binoculars, cameras, telephoto lenses, also fast films, colour photography and sound recording—all essential tools for serious field work.

All the new accretions to knowledge have found their place in the latest work—the 10-volume *Handbook* referred to earlier—along with a great deal of other data collected by several keen Indian ornithologists who had surfaced in the intervening 40 years since the *New Fauna* appeared—and especially, since our Independence. The two most outstanding British ornithologists specializing in Indian birds in the period up to 1943 were Dr. Claud

B. Ticehurst and Hugh Whistler, the former a Captain in the R.A.M.C. during the first World War, who had spent a couple of years in what is now Pakistan, and the latter an Imperial Police Officer in Punjab for a number of years. Since the untimely death of these two veterans—Ticehurst in 1941 and Whistler in 1943—the British era of Indian ornithology has virtually ended. Most of the work thereafter has been done by Indians a few of whom have come into international prominence. A distinguished exception is my colleague and co-author of the *Handbook*, the American Dr. S. Dillon Ripley, now Secretary of the Smithsonian Institution, Washington. Dr. Ripley has been closely associated with Indian ornithology and Indian ornithologists for over 30 years, both in the field and the museum, and in collaboration with Indian colleagues has undertaken several expeditions and made, and continues to make, important contributions to knowledge.

Why Preserve Birds ?

Well-meaning laymen are shocked at the perversity of those who advocate the protection and conservation even of such birds and wild animals as often cause considerable damage to food crops, orchard fruit, forest resources and in other ways, and are thus manifestly inimical to man's interests. Since grain-eating birds attack standing crops in broad daylight, and hawks may occasionally purloin a chicken or two from the poultry yard, their criminal mischief is clear for all to see, and sufficiently self-condemnatory. Thus many birds are arbitrarily singled out for capital punishment, and laymen are convinced that if only these 'vermin' were eliminated all would be well for the poor cultivator and his concerns. It seems to them as simple as that. Against this notion there are those who after careful study and objective assessment maintain that but for birds the world would perish, because without their unrelenting check on insect numbers no plant life would be possible, or the animal life dependent on it including Man himself. How can these two conflicting views be reconciled? That there is much truth in the latter view is evident from the facts. Over 50,000 species of insects have been described from the Indian subcontinent, doubtless with many more still to come. Many of them, such as locusts, beetles, moths, caterpillars and termites, are extremely harmful pests of agriculture and forestry upon which our national economy leans so heavily. The rates of reproduction in insects are truly astronomical. In America it has been computed that a single pair of the Colorado Beetle (*Leptinotarsa decemlineata*) would without natural checks—in which birds play an important part—increase to 60 million in a year. This insect belongs to a family (Chrysomelidae) that is prolifically represented in India. The fecundity and voracity of locusts both in the wingless hopper stage and as flying adults is well known. They lay eggs in the soil, each female laying several capsules or egg-masses of 50 to a hundred eggs each. On a S. African farm of 3300 acres no less than 14 tons of eggs have been dug up, estimated to have produced 1250 million locusts. Locust swarms, often covering up to 300 square km.

and consisting of hundreds of million insects, are sometimes so thick as to obscure the sun, and when on the ground may hold up railway traffic by causing the wheels of locomotives to slip on the tracks. A visitation of such proportions will, in the course of a few short hours, reduce a smiling green tract of hundreds of hectares into a desolate waste of bare stems. White storks and Rosy Pastors and many other birds are traditional predators and take relentless toll of locusts throughout the year although their activities may make little apparent dent at the time of actual swarming.

A large proportion of the normal food of the majority of birds consists of insects. Some idea of the vast extent of their beneficent activities may be obtained from the fact that many young birds in the first few days of their lives consume more than their own weight of food in 24 hours. Even those species that are predominantly granivorous as adults feed their nest-young almost entirely on soft bodied protein-rich insects till they are fledged. Birds have phenomenal appetites. The energy required for flight is generated by their rapid digestion and the efficiency of their metabolism. Birds of Prey, such as the hawks and owls, often unjustly accused of delinquency and slaughtered out of hand, are amongst the most important of Nature's checks on rats and mice, the most fecund and destructive non-insect pests from which man and his works suffer. Rats have a staggering reproduction potential. They produce 6 litters of an average 8 young per annum, and begin to breed when $3\frac{1}{2}$ months old. Hypothetically this means that if the progeny was of equal sexes, and all the young survived, a single pair would increase to 880 rats by the year's end ! As is well known, these rodents are responsible for the destruction of between 10 and 25% of our entire food crops annually, either in the field or as stored grain. A scientific investigation undertaken in the rice growing tracts of the Indus Delta in Lower Sind before partition—in 1926—revealed the annual damage caused by the Sind Mole Rat (*Gunomys indicus*, now *Bandicota bengalensis* kok) in that area to be between 10 and 50% of the total crop and of the order of Rs. 23 lakhs. And that was at a time when paddy was selling at 12 kg. per rupee, again believe it or not ! Owls and the diurnal birds of prey are some of Nature's most important controls on rodent populations. The food of the larger owls consists chiefly of rats and mice. It has been found that a single such owl takes 2 or 3 rats per night. Every two rats destroyed hypothetically means a potential suppression of 880 rats annually. And considering that this good work is carried on for 365 nights in a year with no strikes and no paid holidays, and not by a single owl but by the entire local population of owls, some idea of the untold good they do may be obtained.

Another of the more important activities and impacts of birds on our national economy, which has not yet been properly appreciated or studied, is their role in the fertilization of flowers and the dispersal of seeds, and thus on the character of our indigenous flora and natural vegetation. Many species of birds are adapted morphologically by the structure of

their bill and tongue for a diet of nectar, and are in a great measure responsible for cross-pollinating certain flowers' as they are popularly known—to promote cross-pollination in the process of nectar seeking by the bird visitor. It may not be generally known that the large showy rosy red flowers of the semal or silk cotton tree (*Bombax-ceiba*), which carry a generous supply of nectar, are largely dependent on birds for their fertilization and thus for the natural regeneration of the semal tree, and the sustained yield of the principal basic soft wood for our flourishing safety match industry, which has an annual turnover of several crore rupees. A good example of beneficial seed dispersal by frugivorous birds is the mulberry (*Morus alba*) tree first planted on the banks of irrigation canals in the desert areas of Punjab as a sand-binding and anti-erosion measure. The birds took to the fruit avidly and returned the bounty by broadcasting the seeds in their droppings far and wide, creating abundant natural regeneration of the mulberry tree and showing the way for commercial plantations. Mulberry wood constitutes the principal raw material for the thriving sports goods industry for which Punjab has become famous. In 1967-77 India exported over Rs. 2 crore worth of sports goods, such as cricket bats, hockey sticks, tennis and badminton rackets and other items, to the benefit of our Foreign Exchange reserves. The Sandalwood tree (*Santalum album*), one of the major revenue producers in Karnataka State, also owes its natural abundance to the broadcasting of its seeds by frugivorous birds.

It must be conceded, however, that like most good things in life, the activities of birds are also double-sided. On the debit side of their account must be entered in bold letters their highly negative role in the propagation of noxious weeds, either by fertilizing their flowers such as of the ornithophilous mistletoes (of the plant family Loranthaceae) or by the dispersal of their undigested viable seeds, as also those, for example, of the pernicious Lanthaceae) or by the dispersal of their undigested viable seeds, as also those, for example, of the pernicious Lantana weed. The mistletoes—locally known as 'bandha' or 'karazdar'—are plant parasites that infest orchard trees like mango or guava, and valuable timber stands such as teak and sal. By boring its roots into the tissues of the host-tree and sucking the sap—its life blood—the parasite reduces bearing capacity in the former case, and retards normal growth of wood in the latter, causing considerable economic loss to fruit grower and forester alike. The thousands of square kilometres that have been overrun and rendered unproductive by the Lantana, though a comparatively recent exotic plant introduction, owes largely to the appeal of its lavishly produced berries to fruit-eating birds.

Birds often pose problems other than the direct harm they sometimes do to Man's food resources and allied concerns which, however, they largely compensate, by their countervailing beneficent services. For instance, they unwittingly act as hosts of Zoo parasites, both internal and external, or as carriers of vectors of pathogenic viruses of Man and his livestock,

and disseminate them across the world in the course of their migratory wanderings. In recent years a further cause for their indictment has arisen, namely the increasing hazard they pose to aviation. This has become a serious worldwide problem with the development of fast flying jet aircraft. In spite of considerable sophisticated research in all advanced countries no permanent solution is yet in sight. In India it is chiefly kites and vultures that are responsible for causing serious 'birds strikes' or direct collisions with aircraft, frequently resulting in fatal crashes. Small birds occasionally get sucked into the air intakes of jet engines necessitating extremely expensive repairs or even the complete scrapping of costly engines. Whether birds deserve the blame for such mishaps, or Man himself for trespassing into the birds's pristine domains, is of course, a matter of opinion !

However, taking all things into the reckoning, there is little doubt that the good birds do far outweighs the harm, and they therefore deserve the most stringent protection. It is a hackneyed common-place, nevertheless only too true—and more so in this increasingly material age—that Man does not live by bread alone. By the gorgeousness of their plumages and the loveliness of their forms, by the vivaciousness of their movements and the sweetness of their songs birds typify Life and Beauty. Verily they number among those important trifles that supplement bread in the sustenance of Man and make his living worth while. And to close this plea on behalf of the birds, and for their protection and conservation, I can do no better than quote the introductory remarks of a world renowned biologist the late Sir A. Landsborough Thomson, Chairman of a symposium held in London a few years ago on 'The Problems of Birds as Pests'. He said: "Birds are to a great extent economically beneficial; they are also, of course, scientifically interesting and aesthetically delightful. Yet some species tend to be harmful, and others become pests when present in excessive numbers or in the wrong places. Our task is, dispassionately and objectively, to determine the facts and consider what to do."

White tigers in Indian zoos

There are 18 white tigers in captivity.

Ten of them are in the Delhi zoological park, seven at the Alipore zoological gardens, Calcutta, and one at the Gauhati zoo.

Giving this information in the Lok Sabha today, Mr. S.S. Barnala, agriculture minister, noted that the Delhi and Alipore zoos were the two main centers for breeding white tigers.

Since this rare animal was not breeding successfully in the third generation, attempts to infuse new blood by hybridising white tigers with normal coloured ones had been made, he said. The resulting offspring would be back-crossed with white tigers on maturity.

The hybrid cubs were now about one to 1½ years old. These would attain maturity in about two to three years.

Inquiries had been received from the USA, Japan, Holland, Sweden and Belgium in the past to ascertain the availability of white tigers, but no definite number was offered, the House was informed.

A Brief Note on Project Tiger, Bandipur, Karnataka

By D.G. WESLEY, FIELD DIRECTOR

Bandipur

(Continued from Cheetal, Vol. XX, No. 2 & 3, Dec. 1978/March 1979)

Project Achievements:

Project Tiger was inaugurated in 1973 and since then the following significant achievements have been made.

Administration:

Complete administrative control of the entire Project area has now been transferred to the Field Director. Since the transfer, all forest exploitation both departmental and through lessees has been stopped thus eliminating the biggest single disturbing factor.

Next in order came the elimination of fuel extraction by permit holders; and restricting the grazing to Buffer areas. It has been possible to effectively enforce both the above factors. Today, the core area is completely free of all these disturbances.

Poaching:

A preliminary survey of the Project area immediately after launching 'Project Tiger' indicated that poaching was quite common. Gun shots could be heard frequently. Poachers in groups sometimes consisting of 20 to 25 persons would come and camp in the forest killing anything they could get including elephant for Ivory. Action has been taken to station Project staff in all the important places to prevent poaching. A Diesel Pick up Van is also stationed at Kalkere to transport extra staff in case of trouble. The incidence of poaching has now considerably reduced. To assist the staff engaged in policing the area a wireless network connecting Bandipur with Kalkere, Begur, Chikbargi, Gundalpet and Mysore has been established. This network has really come as a boon to places like Kalkere, Chikbargi and Begur because these areas were completely out of reach by any mode of communication. The staff do not now feel lonely and isolated. There are confident that they can get in touch with their brother officers in a matter of minutes; and get any help required.

The number of cases of wood poaching and wildlife poaching have shown a significant fall during the past 2 years; as can be seen in the following statement:

	1974-75	1975-76
Firewood	216	162
Timber	150	58
Wildlife	9	1

Water facilities created and their utilization:—

A number of water holes and two Pick ups have been constructed in locations where there was acute scarcity of water. Many of these constructed during 1975-76 are now full of

water and are being regularly used by wild animals. A study of the actual utilization of the water facilities created was made by keeping a regular watch. The system is being continued even now. Of the many waterholes created all are being used but observations reveal that some pools are more, favoured than others. Whether this is due to a favourable location or has anything to do with the salt content of water is yet to be investigated. Elephants, Sambar, Chital, Panthers, Tigers, Peacocks, Jungle fowl have been observed at these pools. The most conspicuous animal, of course, is the Elephant; and the most favoured water hole seems to be Alangikatte in Begur State Forest.

Two Pick ups one across Waranchihalla and another at Puradakolli were constructed during 1975-76. Both are now full of water.

Animal population:

Except for estimates regarding the population of wild animals by persons who had intimate knowledge of the area no attempt was made in the past for a systematic counting of animal numbers. The first attempt was made in 1972 with the limited purpose of finding out the number of tigers. As per the count taken in 1972 the number of Tigers in the area was 10. In the year 1975 a small team of Research Students assisted by Project staff and under the guidance of Prof. Madhav Gadgil of Indian Institute of Science, Bangalore, conducted a survey of Elephants. The area covered by them included in addition to the Project area, the adjoining areas of Mudumalai, Wynad and Nagarhole. In this case also the survey was limited to one species—The Indian Elephant.

A census of all wild animals in the Project area was conducted during 1976 October. Except in the case of Elephants, Gaur, Langur, Tigers, Panthers and Chital in all other cases the number of animals seen and counted can only be taken as an indication of their presence in the area. By nature animals like Dhole, Sambar, Wild Boar, Mongoose, Four horned antelope, etc., are not easily seen as they are shy.

The following statement gives the actual numbers of animals counted during the Census.

<i>Species</i>	<i>Males</i>	<i>Females</i>	<i>Young ones</i>	<i>Total</i>
Elephant	235	689	263	1,187
Gaur	70	150	37	257
Spotted Deer	437	1055	342	1,834
Sambar	100	168	34	302
Wild Boar	—	—	—	284
Langur	—	—	—	1,512
Sloth Bear	—	—	—	22
Barking Deer	—	—	—	88
Tiger	9	14	3	26
Panther	—	—	—	22
Dhole	—	—	—	149

Tourist facilities:

An area of 105 Sq. Kms. on either side of the State Highway between Mysore and Ooty is maintained as Tourism Zone. The main portion of it is the old sanctum sanctorum of Bandipur Wildlife Park which has been well organised not only to provide Board and Lodge for visitors, but also to enable them to see the wildlife of the reserve by all possible means. Bandipur is one of the best developed Sanctuaries in India and unlike most sanctuaries has a long 'season' practically round the year. It caters to every class of visitor, from jaded city dwellers seeking forest recreation and a change to an authentically wild environment to serious students of the Plan and animal life of Karnataka; and wildlife photographers of all descriptions. Here over the years a regular grid of motorable roads has been laid carefully so as not to take away from natural quiddity of the open forests; these roads pass close to a number of pools to which elephants and other animals come and there is ample natural forest in between the roads, so that motoring along them one has excellent opportunities of seeing animals, and the trees and the ground flora. Riding elephants are also available.

The number of visitors to Bandipur during 1975-76 was 8,775 of whom 934 were foreigners. The revenue realised is generally about Rs. 1,50,000/- per annum.

The tourism zone is entirely funded by the State. The consolidated figures of expenditure of the Project funds and State funds during 1975-76 are as follows:

Project Funds	Rs. 5,82, 405-63
State Fund	Rs. 5, 02,961-16

Fauna of Corbett National Park

(Continued from Cheetal, Vol. XX, Nos. 2 & 3, Dec. 1978/March, 1979)

By B.S. LAMBA AND R.K. BHATNAGAR

402. *Acrocephalus agricola capistrata* (Severtzov) : Northern Paddyfield Warbler.
403. *Hippolais caligata caligata* (Lichtenstein) : Siberian Booted Tree Warbler.
404. *Phylloscopus collybita tristis* Blyth : Brown Chiffchaff.
405. *Phylloscopus inornatus humei* (Brooks) : Hume's Yellowbrowed Leaf Warbler.
406. *Phylloscopus maculipennis virens* Ticehurst : Western Greyfaced Leaf Warbler.
407. *Phylloscopus trichiloides ludlowi* Whistler : Baltistan Greenish Leaf Warbler.
408. *Phylloscopus trochiloides trochiloides* (Sundevall) : Eastern Greenish Leaf Warbler.
409. *Phylloscopus reguloides kashmiriensis* Ticehurst : Small Crowned Leaf Warbler.
410. *Phylloscopus occipitalis occipitalis* (Blyth) : Large Crowned Leaf Warbler.
411. *Phylloscopus reguloides* (Blyth) : Blyth's Crowned Leaf Warbler.
412. *Seicercus burkii whistleri* Ticehurst : Western Blackbrowed Flycatcher Warbler.
413. *Seicercus anthoschistos albosuperciliaris* (Jerdon) : Western Greyheaded Flycatcher Warbler.
414. *Regulus regulus himalayensis* Bonaparte : Himalayan Goldcrest.
415. *Brachypteryx montana cruralis* (Blyth) : Whitebrowed Shortwing.
416. *Erithacus pectoralis pectoralis* (Gould) : West Himalayan Rubythroat.
417. *Erithacus brunneus* (Hodgson) : Indian Blue Chat.
418. *Erithacus cyanurus pallidior* (Baker) : Kashmir Redflanked Bush Robin.
419. *Erithacus chrysaeus whistler* (Ticehurst) : Western Golden Bush Robin.
420. *Erithacus indicus indicus* (Vieillot) : Whitebrowed Bush Robin.
421. *Copsychus saularis saularis* (Linnaeus) : Indian Magpie Robin.
422. *Copsychus malabaricus indicus* (Baker) : Indian Shama.
423. *Phoenicurus erythronotus* (Eversmann) : Evermans Red Start.
424. *Phoenicurus ochrurus phoenicuroides* (Moore) : Kashmir Black Redstart.
425. *Phoenicurus hodgsoni* (Moore) : Hodgson's Redstart.
426. *Phoenicurus frontalis* (Vigors) : Bluefronted Redstart.
427. *Phycornis fuliginosus fuliginosus* (Vigors) : Plumbeous Redstart.
428. *Hodgsonius phoenicuroides phoenicuroides* (Gray) : Hodgson Shortwing.
429. *Enicurus scouleri scouleri* Vigors : Little Forktail.
430. *Enicurus immaculatus* (Hodgson) : Blackbacked Forktail.
431. *Enicurus schistaceus* (Hodgson) : Slatybacked Forktail.
432. *Enicurus maculatus maculatus* Vigors : Western Spotted Forktail.
433. *Cochoa purpurea* Hodgson : Purple Cochoa.
434. *Cochoa viridis* Hodgson : Green Cochoa.
435. *Cercomela fusca* (Blyth) : Brown Rock Chat.

436. *Saxicola torquata przewalskii* (Pleske) : Tibetan Collared Bush Chat.
437. *Saxicola torquata indica* (Blyth) : Indian Collared Bush Chat.
438. *Saxicola leucura* (Blyth) : Whitetailed Bush Chat.
439. *Saxicola caprata bicolor* Sykes : Northern Bush Chat.
440. *Saxicola ferrea* Gray : Dark-grey Bush Chat.
441. *Oenanthe isabellina* (Temminck) : Isabelline Chat.
442. *Chaimarornis leucocephalus* (Vigors) : Whitecapped Redstart.
443. *Saxicoloides fulicata cambaiensis* (Latham) : Brownbacked Indian Robin.
444. *Saxicoloides fulicata fulicata* (Linnaeus) : Blackbacked Indian Robin.
445. *Monticola cinclorhynchus* (Vigors) : Blueheaded Rock Thrush.
446. *Monticola rufiventris* (Jardine & Selby) : Chestunthellied Rock Thrush.
447. *Monticola solitarius pandoo* (Sykes) : Indian Blue Rock Thrush.
448. *Myiophonus caeruleus temminckii* (Vigors) : Himalayan Whistling Thrush.
449. *Zoothera wardii* (Blyth) : Pied Ground Thrush.
450. *Zoothera citrina citrina* (Latham) : Orangeheaded Ground Thrush.
451. *Zoothera dixonii* (Seebohm) : Longtailed Mountain Thrush.
452. *Zoothera dauma dauma* (Latham) : Smallbilled Mountain Thrush.
453. *Zoothera monticola monticola* Vigors : Large Brown Thrush.
454. *Turdus unicolor* Tickell : Tickell's Thrush.
455. *Turdus albocinctus* Royle : White collared Blackbird.
456. *Turdus bouboul* (Latham) : Greywinged Blackbird.
457. *Turdus rubrocanus rubrocanus* G.R. Gray : Western Greyheaded Thrush.
458. *Turdus ruficollis atrogularis* Jarocki : Blackthroated Thrush.
459. *Turdus ruficollis ruficollis* Pallas : Redthroated Thrush.

Family : Troglodytidae : Wrens.

460. *Troglodytes troglodytes nipalensis* Blyth : Nepal Wren.

Family : Paridae : Tits or Titmice.

461. *Parus major nipalensis* Hodgson : Nepal Grey Tit.
462. *Parus monticolus monticolus* Vigors : Greenbacked Tit.
463. *Parus melanolophus* Vigors : Crested Black Tit.
464. *Parus rubidiventris rufonuchalis* Blyth : Simla Black Tit.
465. *Parus rubidiventris rubidiventris* Blyth : Rufousbellied Crested Tit.
466. *Parus dichrous kangrae* (Whistler) : Western Brown Crested Tit.
467. *Parus xanthogenys xanthogenys* Vigors : Northern Yellowcheeked Tit.
468. *Cephalopyrus flammiceps flammiceps* (Burton) : Western Firecapped Tit.
469. *Aegithalos concinnus iredalei* (Baker) Western Redheaded Tit.

470. *Aegithalos niveogularis* (Gould) : Whitethroated Tit.
 471. *Sitta castanea almorae* Kinnear & Whistler : Western Chesnut Bellied Nuthatch.
 472. *Sitta leucopsis leucopsis* Gould : Western Whitecheeked Nuthatch,
 473. *Sitta himalayensis himalayensis* Jardine & Selby : Himalayan Whitetailed Nuthatch.
 474. *Sitta frontalis frontalis* Swainson : Valvetfronted Nuthatch.

Family : Certhidae : Tree Creepers.

475. *Tichodroma muraria nepalensis* Bonaparte : Wall Creeper.
 476. *Certhia familiaris mandellii* Brooks : Mandellis Tree Creeper.
 477. *Certhia himalayana himalayana* Vigors : Himalayan Tree Creeper.

Family : Motacillidae : Pipits & Wagtails.

478. *Anthus hodgsoni hodgsoni* Richmond : Indian Tree Pipit.
 479. *Anthus novaeseelandiae waiteti* Whistler : Northwestern Paddyfield Pipit.
 480. *Anthus similis jerdoni* Finsch : Brown Rock Pipit.
 481. *Anthus sylvanus* (Hodgson) : Upland Pipit.
 482. *Motacilla flava beema* (Sykes) : Blueheaded Yellow Wagtail.
 483. *Motacilla flava melanogrisea* (Homeyer) : Turkestan Blackheaded Wagtail.
 484. *Motacilla citreola citreola* Pallas : Northern Yellowheaded Wagtail.
 485. *Motacilla citreola werae* (Buturlin) : Western Yellowheaded Wagtail.
 486. *Motacilla caspica caspica* (Gmelin) : Grey Wagtail.
 487. *Motacilla alba dukhunensis* Sykes : Indian White Wagtail.
 488. *Motacilla alba personata* Gould : Masked Wagtail.
 489. *Motacilla alba alcoides* Hodgson : Hodgson's Pied Wagtail.
 490. *Motacilla maderaspatensis* Gmelin : Large Pied Wagtail.

- Family : Dicaeidae : Flowerpeckers.

491. *Dicaeum agile agile* (Tickell) : Indian Thickbilled Flowerpecker.
 492. *Dicaeum melanoxanthum* (Blyth) : Yellowbilled Flowerpecker.
 493. *Dicaeum erythrorhynchos erythrorhynchos* (Latham) : Tickell's Flowerpecker.
 494. *Dicaeum ignipectus ignipectus* (Blyth) : Firebreasted Flowerpecker.

Family : Nectariniidae : Sunbirds.

495. *Nectarinia asiatica asiatica* (Latham) : Indian Purple Sunbird.
 496. *Aethopyga gouldiae gouldiae* (Vigors) : Mrs Goul's Sunbird.
 497. *Aethopyga saturata saturata* (Hodgson) : Himalayan Blackbreasted Sunbird.
 498. *Aethopyga siparaja seheriae* (Tickell) : Indian Yellowbacked Sunbird.
 499. *Aethopyga ignicauda ignicauda* (Hodgson) : Firetailed Yellowbacked Sunbird.

(To be continued)

Status of The Tiger In Gujarat State

M. A RASHID

The present State of Gujarat, situated on India's west coast between latitudes 21° to 24° N and longitudes 69° to 75° E was carved out of the erstwhile composite Bombay State which was bifurcated into the States of Gujarat and Maharashtra with effect from 1st May, 1960. Gujarat's forest area is 19,666 sq. km representing roughly 10% of its geographical area. The wide variations in the climate and topography of the State have resulted in various types of forests ranging from luxuriant moist deciduous teak forests in Dangs in the South to arid thorny scrub and saline desert conditions in North Gujarat and Kutch respectively. The major concentration of forests occurs all along the eastern border of the State from north to south, bordering on the States of Rajasthan, Madhya Pradesh and Maharashtra in that order. The Saurashtra Peninsula carries only a few small pockets of forest in the hilly portions, the largest and most compact being the Gir Forest of Junagadh district which is well known as the last stronghold of the Asiatic lion. The plain areas of the State are now generally devoid of forest cover and are mostly under cultivation or pastures.

Although deficient in terms of forest area, Gujarat possesses a relatively rich variety of wild fauna, including such species as the Asiatic lion, Indian wild ass, tiger, panther, sloth bear, wolf, hyaena, cheetal, sambar, barking deer, four-horned antelope, black buck, chinkara, wild boar, bluebull and among birds, the great Indian bustard, flamingo, grey jungle and red spur fowls, peafowl, partridge (grey, painted and black) and numerous species of resident and migratory water birds. The more important animals (excluding the lion, wild ass and black buck) are mostly confined to the eastern forest belt referred to earlier. However, there has been an alarming depletion of their numbers in recent years, particularly after the attainment of Independence and the abolition of the princely States (of which the Gujarat region contained a sizeable number) in general conformity with the similar trend observed in the rest of the country also.

The major factors leading to this steady depletion of wildlife in the State over the past three decades may be briefly summarised as under:-

1. Steady loss of forest areas for purposes of agriculture and grazing due to the prevailing insatiable land hunger, hydel projects and the rehabilitation of persons affected by such projects, urban and industrial development, etc. all of which have inevitably led to the destruction and shrinkage of the traditional habitats of wildlife which had to either flee into the interior areas or perish in the face of this relentless onslaught both from man and his equally aggressive domestic livestock which usurped the lion's share of the natural fodder supply available in the forest.

*Additional Chief Conservator of Forests (Wildlife), Gujarat State.

2. Indiscriminate hunting and merciless persecution of wildlife on a commercialized scale, particularly through the gross misuse of so-called crop protection guns for which licences were issued liberally by the popular Governments after the attainment of Independence—which concurrently seems to have sealed the doom of wildlife throughout the country as a whole.
3. Gujarat is amongst the States with a high percentage of tribal population most of which inhabit the eastern forest belt and are traditionally hunters and meat eaters. Arming such a population with a liberal supply of firearms for protecting their crops against wild animals has proved disastrous to our wild life.
4. Constant human disturbance and decrease in the population of prey animals due to poaching.
5. Last, though by no means the least, must be mentioned the general apathy—if not antipathy—towards wildlife prevailing in the State, particularly amongst the predominant agricultural community which looks upon wildlife as a nuisance and a menace to his crops and livestock. There is thus no effective lobby to champion the cause of wildlife and to cry a halt its decimation.

Coming specifically to the status of the tiger in Gujarat, I must admit that there is a woeful lack of any authentic records or reliable data on the subject. Whatever old records are available prior to 1960 pertain to the erstwhile Bombay State of which the present Gujarat State was almost an insignificant part for which no separate statistics were maintained. However, relying on my own personal knowledge as a Forest officer who has worked in the area from 1951 onwards, I can say that tigers were fairly abundant in the following regions of Gujarat up to the early sixties (please see attached map):—

- (i) Whole of Dangs district
- (ii) Bansda, Dharampur, Kaprada and Nanaponda areas of Valsad district.
- (iii) Mandvi, Songadh, Vyara, Vajpur (Satkashi area), Nessu and Ukai areas of Surat district.
- (iv) Dediapada, Sagbara, Gora, Junaraj and Netrang areas of Bharuch district.
- (v) Ratanmahal area of Panchmahals district.
- (vi) Vijaynagar area of Sabarkantha district, and
- (vii) Danta Ambaji, Borian and Amirgadh areas of Banaskantha district,

Although no authentic tiger population figures are forthcoming, it is my guess that there might have been not less than 50 tigers in Gujarat around 1960 when the State came into existence. The Wildlife Administration Reports of Gujarat State for the first 3 years show that 3 tigers were shot during 1960-61 and 2 in 1962-63. With effect from 1963-64,

tiger was declared as a protected species in Gujarat vide Govt. Notification Agriculture & Cooperation Dept. No. WLP/2863/21232--P dated 29.10.63. Thereafter, there is only one recorded instance of a tiger having been shot by a poacher near Waghai in Dangs district during 1969-70. Prior to 1960, I know of tiger having been observed in Vijaynagar area of Sabarkantha district and in Danta and Borian areas Banaskantha district around 1951-52. A man-eating tiger was shot by Shri Kasimkhan J. Khan of Rajpipla in the Dediapada area around 1952. The erstwhile princely States of Danta, Rajpipla and Baroda (Satkashi area of Surat district) were particularly well known as tiger hunting grounds for the royal guests.

Gujarat has the unique distinction of possessing both the Asiatic lion as well as the tiger—though both have occupied entirely different habitats. Both these felines are migrants into India—the lion from Central Europe through the north-western passes and the tiger from the icy wastes of Siberia and Manchuria through the north-eastern passes. A comparison of their relative survival prospects makes an interesting study. With the passage of time, the tiger is believed to have generally fared better than the lion in the struggle for survival partly because of its comparative shyness and cunning with regard to human presence (in contrast with the lion's comparatively bold and unguarded approach) and partly due to the tiger's preference of a comparatively denser and well wooded habitat. The lion's habit of living and moving in 'prides' in open country has also to some extent made it more vulnerable to predation by man. As the combined effect of all these factors, we still have around 2000 tigers in the country today, as against 1/10th that number in the case of lions. Within Gujarat State, however, the position is the other way round, the lion having stubbornly held his ground (if not actually flourished, at least during the current decade), whereas the tiger virtually stands at the threshold of extinction. This anomalous position could perhaps be explained by the fact that the tiger lived in the eastern forest belt inhabited by meat-eating tribals who decimated the natural prey animals of the tiger thereby compelling it to migrate to other relatively less disturbed and better hunting grounds across the State's borders; whereas the lion, apart from enjoying strict protection ever since the erstwhile Junagadh State regime, had to contend mainly with 'maldharis' (professional graziers) who are strict vegetarians and only posed a threat to the lions through occasional cases of poisoning carcasses of buffaloes or cows killed by the lions and through the steady degradation of the Gir forest habitat through excessive overgrazing by their large cattle herds at the cost of the local wild ungulates. The lions are also fortunate that the Gir lion sanctuary project launched by the State Government in 1972 came to their rescue just in the nick of time through elimination of the unhealthy competition from the maldharis and their teeming livestock and their perpetuation is now ensured.

The tiger in Gujarat, on the other hand, has unfortunately received no special attention or protection so far and has been partly decimated (being a far more prized and sought after

trophy than the lion), and partly compelled to migrate across the State's borders due to lack of its natural prey on our side of the border.

Apart from the pre-"Project Tiger" census of tigers carried out in 1972, which indicated the presence of about 8 tigers in Gujarat, no other systematic attempt to estimate the population of this species has been made so far. A tiger census proposed to be undertaken during November 1978 could not unfortunately be conducted due to unavoidable reasons. This will now be taken up during the ensuing summer season, when the next lion census in Gir is also due. The indications, however, are that the existing tiger population in Gujarat could possibly be counted on the fingers of one hand—and that too in Dangs district only.

In an attempt to rehabilitate the tiger in Gujarat the State Government is actually considering the setting up of a new National Park near Bansada bordering the Dangs forest in the sanguine hope that this will encourage the tiger to return to its old favourite haunt where it will receive complete protection and be assured of adequate supply of its natural prey.

Description of a new subspecies of a cyprinid and a new distributional record of sciaenid from Poonpun river, a tributary of river Ganga near Patna (Bihar)

By

Raj Tilak

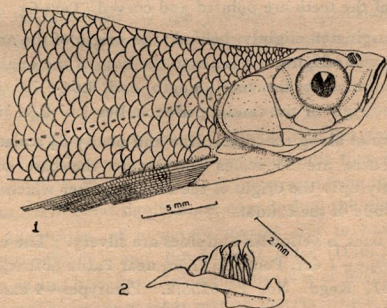
Zoological Survey of India, Calcutta.*

I—INTRODUCTION

During a study of the fishes of the river Ganga near Patna, the material of two species has been found to be interesting. One of them is allied to *Salmostoma sardinella* (Valenciennes) but differs from it in important characters and has been described as a sub-species. The second is of *Johnius belengeri* (Cuvier), a marine fish of the family Sciaenidae. This species has so far been recorded from seas of India to Malaya Archipelago and beyond. The present record of this species from fresh water is important from both distributional and physiological points of view. In this paper notes on these species have been included.

II—OBSERVATIONS

Salmostoma sardinella poonpuni, ssp. nov. (Text-figures 1-2).



Text-figure 1. Lateral side of the anterior half of the body of *Salmostoma sardinella poonpuni*, ssp. nov.

2. The pharyngeal bone and teeth of *Salmostoma sardinella poonpuni*, ssp. nov.

*Present Address:—Zoological Survey of India, Northern Regional Station, Dehra Dun (U.P.).

? 1962. *Oxygaster sardinella*, Karamchandani, *Trop. Ecol.*, 3, pp. 79, 81.

? 1962. *Oxygaster argentea*, Karamchandani *Trop. Ecol.* 3, pp. 80, 81.

B iii, D 2/7, p 1/11-12, v 1/7, A 3/15-18, C 19, Lat. 1. 45-50, Lat. tr. $7\frac{1}{2}/3\frac{1}{2}$.

The body is laterally compressed and its dorsal profile is somewhat straight upto the dorsal fin, after which it descends a little up to the base of the caudal. The ventral profile of the body is arched and behind the pelvics, it ascends gradually to the base of the caudal. The head is small and it lies 5.57-6.15 times in total length and 4.55-5.11 times in standard length of the body. The height of the body lies 5.6-6.48 times in total length and 4.62-5.27 times in standard length. The eye lies almost in the anterior half of the head and has a free orbital margin. The diameter of eye lies 2.69-3.42 times in the length of the head. The snout is smaller than the diameter of the eye and lies 1.15-1.58 times in it, 1.18-1.36 times in the interorbital width and 3.93-4.46 times in the length of the head.

There is a knob at the symphysis of the lower jaw which is longer than the upper jaw. The posterior end of the lower jaw lies below the anterior end of the eye whereas that of the maxilla reaches only upto a vertical drawn from the posterior nostril and does not reach the eye. The infraorbital ring of bones is broad and stout and remains separated from the preopercular ridge. A sensory canal passes through them. The two nasal apertures lie close together, the anterior being small and round while the posterior one elongated. The abdomen is keeled and the keeled portion starts slightly ahead of the origin of the pectorals.

There are 11 pharyngeal teeth arranged in 3 tiers on the pharyngeal bone (5-4-2/2-4-5). The tips of the teeth are pointed and curved (Text-fig. 2).

The dorsal fin originates slightly behind the origin of the anal. The pectorals do not reach the base of the ventrals, nor the latter to the base of the anal. The length of the pectoral fin lies 5.14-5.72 times in the total length and 4.04-4.73 times in the standard length of the body. The height of the caudal peduncle lies 1.67-2.34 times in its length.

There are 45-50 scales along the lateral line and nearly $3\frac{1}{2}$ scales between it and the base of the pelvic fin. There are 33 scales anterior to the base of the dorsal fin. The lateral line descends gently upto the origin of the anal fin, after which it ascends and ends at the base of the lower lobe of the caudal.

The colour of the back is yellowish and sides are silvery. The edge of the caudal is somewhat dusky. Holotype—1 exr, Poonpun river, near Patna (Bihar), coll. T. Venkatesw-
rulu and party, 7.8.1967, Regd. No. F. 6155/2. Paratypes—4 exs., Poonpun river, near Patna (Bihar), coll. T. Venkatesw-
rulu and party, 7.8.1967, Regd. No. ZS.I. F. 6156/2.

Relationships:—Karamchandani (1962) reported the occurrence of *Salmostoma sardinella* (Val.) [= *Oxygaster sardinella* (Val.)] and *S. acinaces* (Val.) [= *Oxygaster argentea* (Bay)] in Ganga

river at Digwara. He has not given the details of the morphological characters of his material except the anal fin count. The present material could be similar to that reported by Karamchandani (1962) but its detailed study and comparison with the material of *Salmostoma sardinella* and *S. acinaces* in the collections of the Zoological Survey of India, Calcutta shows that it has affinities with both in the number of rays of the anal fin and scales in the lateral line. At the same time it differs from both in morphometric and other characters such as (1) the length of the maxilla in relation to the priorbital length of head. The maxilla does not reach the eye, (2) the pharyngeal bone bears 11 teeth, arranged in 3 tiers (5-4-2/2-4-5) in comparison to 10 teeth in *S. acinaces*, arranged as 5-3-2/2-3-5 and 12 in *S. sardinella*, arranged as 5-4-3/3-4-5, (Day, 1878) and (3) the lateral line ends in the lower half of the caudal base. This material resembles *S. sardinella* and differs from *S. acinaces* in (1) the origin of the dorsal fin being behind that of the anal, (2) the infraorbital ring of bones separated from the preopercular ridge and (3) the pectorals not reaching the base of the ventrals. According to Day (1878) *S. acinaces* is distributed in peninsular India and *S. sardinella* in Burma. Banarescu (1968) records *S. acinaces* from S. India and Hooghly river, and *S. sardinella* from Burma, Orissa and Bengal. As the range of variation of the above mentioned characters in large samples within these species are not precisely known, it would be appropriate to place the present material as a subspecies of *S. sardinella* (Val.) to which it is comparatively more allied.

Johnius belengeri (Cuvier)

1830. *Corvina belengeri* Cuvier (in Cuvier and Valenciennes), *Hist. Nat. Poiss.*, 5, p. 120.
 1936. *Johnius belengeri*, Weber and Beaufort, *Fish. Indo-Austral. Archipel.*, 7, p. 533.

This species is characterised by the presence of quadrilobate upper lip, which is lacking in the allied species of this genus. In the present collection, there are 3 examples of this species (2 exs., juveniles, measuring 114 mm. and 122 mm. standard length, purchased from Patna market and 1 ex., young, measuring 36 mm, standard length, from Poonpun river, Fatwa, Patna, 7.8.1967. This species has so far been recorded from seas around India to Malaya Archipelago and beyond (Weber and Beaufort, 1936) and according to Day (1878) it is more common on the western coast of India than in the Bay of Bengal. The occurrence of this species in Ganga river, as far upstream from the east coast as Patna (distance nearly 800 kms.) is of great significance, considering the physiological implications with regard to the adaptation of a purely marine fish to freshwater habitat. Other sciaenids such as *Poma poma* (Ham.) and *Pseudosciaena coitor* (Ham.) also occur in Ganga river at Patna and have earlier been recorded from this river at Digwara by Karamchandani (1962). *Johnius dussumieri* (Cuvier) is another marine species which occurs in fresh waters of Mahanadi river at Hirakund Dam site (David, 1953). *Johnius belengeri* (Cuvier) attains a good size and could be exploited from a commercial angle. It adds to the commercially important fish fauna of river Ganga.

III—SUMMARY

During a study of the fishes of the river Ganga, material of two species came to the notice of this author for special attention. There is material of a cyprinid fish which resembles *Salmostoma sardinella* (Val.) but differs from it in some important details. This material has been described as a subspecies of *S. sardinella*. The material of *Johnius belengeri* (Cuvier), which has hitherto been recorded from seas of India and further east, has been found to exist in the fresh water of river Ganga, nearly 800 Kms. upstream from the sea coast. The presence of this species at Patna is interesting from distributional and physiological points of view.

IV—ACKNOWLEDGEMENT

The author feels grateful to Director, Zoological Survey of India, Calcutta for encouragement.

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Recovery of Wild Buffalo from Panna

"Vana Bhainsa" is a term widely used by local people for Gaur, wild buffalo, and feral cattle in Madhya Pradesh. There were rumours of one such "Vana Bhainsa" south of Panna district adjoining Jabalpur. During the course of my inspections of Gangau Sanctuary in Panna, I heard about this animal. Some people were saying that it is a Gaur, some said it is ordinary buffalo with exceptionally large horns, some said it is "Vana Bhainsa" which carried no meaning for me. I enquired about different characters such as shape of horns, white stockings etc. of the animal from those who had seen the animal but nobody had seen the animal with that detail so as to establish its identity. In view of the fact that wild buffalo have never been known to occur in this part of the country in historic times, no one bothered to verify it and I had my own doubts about its being a wild buffalo. But the rumours were so strong that I could not resist myself to see the animal, though for this I had to take up a very tedious journey of 130 km in the Vindhyan hill ranges.

I arrived at Raipura range headquarter at about 1400 hours on 15th of February 1979. On enquiry the range officer told that the animal is present near village Rupjhir.

I was told at Panna that the animal is wounded by a bullet on its left fore limb. The leg has been broken and it is not able to walk properly. To deal with such an animal I had already taken care to keep tranquillising equipment and for help a veterinary doctor with necessary veterinary kit.

We arrived at Rupjhir village at about 1530 hours. The guard showed me the animal in a distant wheat crop fields. Only horns were visible. I walked down to the animal which was lying flat almost dead. It took no time for me to identify and to my great surprise it was a real wild buffalo bull (*Bubalus bubalis* Linn.). The animal was beaten to death by the villagers with the help of ballam, lathi and pelting stones. The reason was that it had started depredating on the tender wheat crop and no amount of people could drive it away from the crop fields. The left front foot was broken from above the knee joint and pus was coming out. As the animal could not place its broken foot on the ground its mobility was greatly reduced. Though it retained its aggressiveness and did not allow human beings to approach very close but continued depredation on the fresh crop which enraged the villagers who had beaten the animal in an abortive bid to finish it. Whole of its body was ruffled and bleeding, left eye was partly damaged and the animal had a little higher temperature.

The animal has massive typical wild buffalo shaped horns with triangular cross-section. Large ears with ruffs, white stockings, white lower chin and two white spots at the beginning of eye brows. The animal is huge in built and is weighing about 1000 kg. The tip to tip distance of the horns is 87 cm. and spread 194 cm.

When I first touched the animal it moved its head but could not get up. Looking to the serious condition of the animal first aid was given in which veterinary doctor really proved helpful. With the help of long sticks phenyl dressing was done. At first the animal moved its head with aggressiveness but after some time it stretched again. The condition of the animal was pitiable. Either it seemed to have thought that we have come for his rescue and not to kill him or it was saying that "O man (the most dangerous animal) I am at your disposal now either you kill me or save me". After thorough dressing, fly repellent powder was sprinkled over the wounds and the doctor injected 1000 mg. penidure a wide spectrum antibiotic. After taking stock of the situation the guards were posted for the night watch to observe the animal and to save the animal from the mischievous villagers.

I rushed back to Panna and contacted Chief Wild Life Warden Shri J.J. Dutta on phone. He assured me the help of veterinary specialist and advised me not to save any effort in keeping the animal alive.

Next morning again it took nearly nearly whole day to reach at the spot but I was delighted to see the animal standing under a Kauha (*Terminalia arjuna*) tree by the side of a nala. The guards told me that an hour after sunset the buffalo got up, grazed whole night and morning in wheat crop and went to the nala during hot hours but it could not get down to take water. A bucket full of water was placed near the animal but it was not taken. At this thime of the year it is not very hot during the day time and probably tender wheat crop was enough to supply the water requirement for existence.

The watch and ward continued the following night. The buffalo went to crop fields at 2100 hours and grazed the whole night. Next morning when I examined the animal it was sitting in a crop field. There was a great hue and cry among the villagers about the damage to their crop. Immediately the Patwari was contacted and asked to assess the damage. The villagers were assured that they will get full compensation of the crop damaged by the wild buffalo after the proper assessment.

The buffalo got up at 0900 hours and started grazing the crop. No amount of human could drive it way from the crop field. On the other hand buffalo advanced towards the people in an aggressive manner and did not allow any body to get closer. In the meantime help came from Bhopal. Dr. Kanda a vet. orthopedic specialist arrived

to help the animal. In the afternoon the animal went inside the nala having sufficient water for a dip.

This was the best opportunity to capture the animal. Quickly we prepared for roping the animal. All the stout ropes of the village were procured. Three sets of rope were prepared twining 2-3 ropes together. The animal would not allow the rope to touch its horn. At times the animal took a dip in the nala which lasted for 1 to 2 minutes. For an hour the animal kept on swimming from one side to other of the nala without allowing us to put the rope. When it was tired we succeeded in putting up a rope around its horns. Two stout villagers went inside the nala to drag the animal but they failed. After another hour's effort we succeeded to drive the buffalo towards shallow water. One more rope was tied around the horns and at last it came to the bank of nala, by this time whole village population was present to witness the capture. It took 30 stout villagers in front to pull and few from behind to make the animal walk in a desired direction on its three legs. Ultimately we succeeded in tying the buffalo by a mango tree 50 metres away from the nala bank. The animal was allowed to take rest. Green fodder was provided which was taken by the animal readily right from first day.

Next day in the afternoon the animal was tranquillised with the help of mixture of rompun 500 mg and vetelar 400 mg. The effect of the drug was complete in 17 minutes. Dr. Kanda operated upon the wound to remove the foreign body (bullet). Though hard fibroses had developed around the wound but pus was still flowing. In a small operation Dr. Kanda could not get the bullet. On enquiry the villagers told that the animal was wounded about 5 months back by a gun shot. The bone above the knee was broken and false ossification had taken place. Doctor showed the anxiety that the bullet might have been arrested in between the broken bone which was not possible to take out in such a small operation. The animal was thoroughly dressed. Glucose, novelgin, terramycin was given for speedy recovery of the animal. The effect of the drug lasted for 3½ hours. Afterwards the animal got up and started feeding. The course of treatment was prescribed by the doctor and it was decided to keep the animal tied so that proper treatment could be given. This was also necessary to get the animal used to human beings and to develop a degree of tameness for further handling of the animal.

In the mean time the matter was referred to Bombay Natural History Society, Director Zoological Survey of India and U.N.E.P. office for Asia and Pacific in Bangkok alongwith the photographs. The Director, Zoological Survey of India confirmed it to be a wild buffalo (*Bubalus bubalis* Linn.) B.N.H.S. and U.N.E.P. also said that from the photograph the animal does look like a wild buffalo.

Shri M.K. Ranjitsinghji of U.N.E.P. Bangkok have suggested following causes of the origin of this specimen at Panna.

(1) That this is a case of "through back" plain and simple though the possibility is little remote.

(2) That a young male domestic buffalo sired by a wild bull either in Bastar or in Assam was bought and brought to Panna area and become feral.

(3) Or a she buffalo which has mated with a wild bull in either of these two places was brought over to Panna and the offspring became too large to handle and became feral.

After about a month later on 21st March 1979 the animal was again tranquillised, loaded in a truck and transported to Jabalpur Veterinary College Hospital for a distance of 120 km safely. This time also the animal was tranquillised with the same dose of drugs. The effect came about in 10 minutes and lasted for 4 hours. The pus continued to flow from the wound and the animal became weak. After the recovery of the animal from transportation shock and when it got used with the new place of confinement the animal was again tranquillised and taken to the X-ray room. X-ray gave the clear picture of the broken bone. There was no bullet inside.

Dr. Pandey, Professor of Surgery who is attending the animal personally have removed 5 broken pieces of the bone after a minor operation. He is very hopeful that the animal will be cured and survive.

The wild buffalo is a protected animal and is included in the schedule I of the Wild Life (Protection) Act 1972. In the first half of the 19th century the wild buffalo were known to occur in Mandla, Raipur, Sambhalpur and Bastar districts of peninsular India. Present distribution of this animal is confined to the west Bastar only where it has been given effective protection in Kutru wild life sanctuary. The wild buffalo are also found in Himalayan Terai area.

I am planning to carry out a survey of the area. Who knows that the vast stretches of forests in the state of Madhya Pradesh still hold some remnant population of this rare species.

S.M. HASAN, A.I.F.C., DIP. IN WLF. MGMT.
Deputy Conservator of Forests (Wildlife), Madhya Pradesh, Bhopal

Vertebral Anomaly in the Catfish, *Wallago attu* (Bloch & Schneider) (Siluriformes : Siluridae)

AKHLAQ HUSAIN

Zoological Survey of India, Northern Regional Station, Dehra Dun.

Introduction

The vertebral anomaly in some Indian catfishes has been described by Sarkar and Kapoor (1956), Tilak (1961), Datta—Gupta and Tilak (1962), Mathur and Yazdani (1969), Tilak and Sinha (1971) etc. based on external deformity of the body. Recently, while studying the osteology of the commercially important catfish, *Wallago attu* (Bloch & Schneider) in relation to sexual dimorphism (Hussain, 1970), the author came across four specimens with variously deformed vertebrae which have been described in this paper. These specimens were procured from Saharanpur District (Uttar Pradesh).

Morphometric and Meristic Characters Unaffected by Deformity

The specimens were well built adults of both the sexes and apparently normal both in morphometric and meristic characters.

The length of head is contained from 4.8 to 5.3 times and the maximum depth of body is contained from 5.0 to 6.1 times both in the total length. The diameter of eye is contained from 10.1 to 14.4 times and the length of pectoral spine is contained from 1.6 to 1.8 times both in the length of head. The number of branchiostegal rays and the fin rays is within the range (B. 19-21; D. I/4; P. I/13-15; V. I/7-9; A. IV/82, 82-89; C. 17). The total number of vertebrae in these specimens varied between $70\frac{1}{2}$ to $72\frac{1}{2}$ (5 forming Weberian apparatus + 11 to 12 posterior abdominal vertebrae + 54 to 56 caudal vertebrae + $\frac{1}{2}$ incomplete caudal vertebra continuous with urostyle). The details of each specimen are given in the table.

Vertebral Deformity

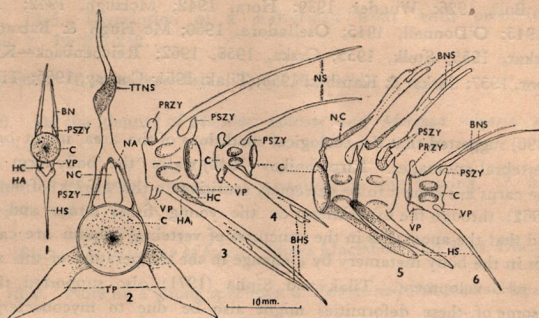
(Figs. 1-6)

Four kinds of the deformities in the present specimens were observed in the neural and the haemal spines of the vertebrae in posterior abdominal and caudal regions as per the details given below:—

1. *Bifurcation of the neural spines*:—The neural spines of the 11th and the 12th vertebrae of the specimen No. 1 (Fig. 5) and that of the 15th vertebra of the specimen No. 4 are bifurcated incompletely, leaving a groove upto the base of the spine.

Table. Details of four specimens of *Wallago attu* (Bl. & Schn.) showing vertebral deformity

Specimen No.	Sex	Total length	Head length	Eye diameter	Pectoral spine length	Maximum body depth	Weight	Number of vertebrae	Deformity
		in mm					in gm		
1.	Male	610	120	11	75	100	1100	72½	Bifurcated neural spines
2.	Female	710	147	14	83	142	2250	71½	Thickenings and twists on neural spines
3.	Male	720	137	12	85	118	1900	72½	Bifurcated haemal spines
4.	Female	720	142	14	81	127	1950	70½	Bifurcated neural and haemal spines and thickenings and twists on neural spines



1. Posterior view of 56th vertebra of specimen No. 1
2. Posterior view of 14th vertebra of specimen No. 2
3. Postero-lateral view of 48th vertebra of specimen No. 3
4. Postero-lateral view of 69th vertebra of specimen No. 3
5. Antero-lateral view of 11th and 12th vertebrae of specimen No. 1
6. Antero-lateral view of 56th vertebra of specimen No. 1

2. *Complete absence of the neural canal*:—The neural canal is absent in the 56th vertebra of the specimen No. 1 (Figs. 1 and 6) due to the complete bifurcation of the neural spine and neural arch.

3. *Bifurcation of the haemal spines*:—The haemal spines of the 48th (Fig. 3) and the 69th (Fig. 4) vertebrae of the specimen No. 3 are bifurcated incompletely in the same manner as that of the neural spines of the specimens Nos. 1 and 4 but a little more.

4. *Thickenings and twists on the neural spines*:—The neural spines of the 12th to 18th vertebrae of the specimen No. 2 (Fig. 2) and that of the 18th to 24th vertebrae of the specimen No. 4 bear thickenings at places with curves or twists.

Discussion

The probable causes of the vertebral anomalies dealt in many groups of fishes have been explained variously by many workers during the past (Cobbold, 1855; Dyce, 1960; Hyrtle, 1862; Smith, 1865; Holt, 1890; Howes, 1894; Ritchie, 1908; Storrow, 1909; Gemmill,

1912; Ford & Bull, 1926; Wunder, 1939; Hora, 1942; McHugh, 1942; Law, 1944; Kirpichnikov, 1945; O'Donnell, 1945; Oselladore, 1950; Mc Hugh & Barraclough, 1951; Kapoor & Sarkar, 1955; Stolk, 1955; Orska, 1956, 1962; Reichenback—Klinke, 1957; Sarkar & Kapoor, 1957; Sarkar & Kaushik, 1958; Tilak, 1961; Conroy, 1965; Tilak & Sinha, 1971 etc.).

Holt (1890) suggested that the ecological conditions of the area might be one of the causes of the vertebral anomalies. Kirpichnikov (1945) states "the body form and the rate of growth of the carps are known to be extremely sensitive to the effects of environments". Orska (1956, 1962), through the experiments on the young fishes (trout and pike respectively), revealed that the anomalies in the structures of vertebral column are caused due to the disturbances in the body metamery by a change in the temperature of the water during the early stages of development. Tilak and Sinha (1971) also supported this view but suggested that some of these deformities might also be due to mycobacterial infection. Kapoor and Sarkar (1955), Sarkar and Kapoor (1957) and Sarkar and Kaushik (1958) have suggested that external mechanical injuries, compressions or unfavourable influences during the period of development are probably the causes of the vertebral anomalies. Gemmill (1912) reviewed the work on these abnormalities and concluded that no single factor could be held responsible for such conditions.

In the present case, the different stages of the bifurcation in the neural and haemal spines and the absence of neural canal in the vertebrae, have possibly developed due to the changes in the ecological conditions especially the temperature during the early stages of development of the fish as mentioned by Holt (1890), Kirpichnikov (1945), Orska (1956, 1962), Tilak & Sinha (1971) etc. The possible explanation for the thickenings and the twists or curves on the neural spines could be that the deformity was the result of a mechanical injury (Kapoor & Sarkar, 1955; Sarkar & Kapoor, 1957 and Sarkar & Kaushik, 1958) at some stage of life followed by some infection (Tilak & Sinha, 1971) and irregular calcification. These hidden deformities did not bring any morphometric change in the body proportions of the present specimens and did not hinder in the taxonomic studies.

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Key to the Abbreviations Used

BHS	— bifurcated haemal spine	NC	— neural canal
BNS	— bifurcated neural spine	NS	— neural spine
C	— centrum	PRZY	— prezygapophysis
HA	— haemal arch	PSZY	— postzygapophysis
HC	— haemal canal	TP	— transverse process
HS	— haemal spine	VP	— ventral process
NA	— neural arch		

Population Status of Indian Blackbuck (*Antilope cervicapra* Linn.) and Spotted Deer (*Axis axis* Erxleben.) in Ballavpur Wild Life Sanctuary, West Bengal

By

T. BHATTACHARYA AND BRATINDRA NATH CHATTOPADHYAY

Department of Zoology, School of Life Sciences, Visva-Bharti University,
Santiniketan 731235

Ballavpur Wild Life Sanctuary is situated near Santiniketan, West Bengal, in the vicinity of Visva-Bharati University (23°45' N: 87°4' E). An account of the climate and soil of the area is discussed elsewhere by Bhattacharya (in press).

In 1955 about 203.35 acres of extensively eroded and barren laterite tract of the area, under the Ballavpur Forest Range was put into afforestation. 100 acres of land in Goalpara Beat under this forest range was fenced in order to establish a 'Deer Conservation Unit' (Goalpara Deer Park). The total area comprises of 40 acres of water logged and swampy area and 60 acres of undulating, partly vegetated and partly unvegetated eroded land.

On 10.9.1967, 4 male and 7 female *Antilope cervicapra* were introduced in this park. In the next year, on 21.2.1968, 4 male and 4 female *Axis axis* and 3 mouse deer *Tragulus memmina* Erxleben, were also introduced. All the mouse deer exterminated within a month's time perhaps due to the very hot and dry climate of the area. However, the two other species successfully thrived and multiplied. Another 290 acres of land 'Phase II', adjacent to the existing Deer Park—'Phase I', has been fenced in such a way so that in future the two may be united into a single fenced land unit.

At present a total area of 490 acres under Ballavpur range, including the Deer Park, has been declared as a "Wild Life Sanctuary" with effect from 16th August 1977. Present paper deals with the population growth and population status of the blackbuck and spotted deer of the Sanctuary upto the end of 1977.

Range Condition

First plantation programme over this sparsely vegetated laterite tract was undertaken during 1955. Tall trees specially Sal (*Shorea robusta*), Cashew nut (*Anacardium occidentale*), Sonajhuri (*Acacia auriculiformes*), Palash (*Butea monosperma*), Sisoo (*Dalbergia sisoo*), Mahooa (*Bassia latifolia*), Siris (*Atbizia lebbek*) etc. were planted during that time.

In 1968 and 1974, *Penisetum pedicilatum* and in 1968 and 1975 *Fragmaris* sp. were tried to establish a ground vegetation in the bare soil. Some concrete water-brakes were erected during 1972 as a part of the soil conservation programme. In 1975, the forest developed quite thick with considerable undergrowth in certain areas coupled with some open patches in between.

Blackbuck

POPULATION GROWTH (Table 1)

Since the inception of this Deer Park the Blackbuck population has steadily increased with an average annual growth rate of 2.36 per year. Although the official count show a population of 56 individuals (18 males; 29 females; 9 fawn, at the end of 1977—yet we could count only 37 individuals (6 males; 28 females; 3 fawn). Present population status, therefore reflects an alarming decline in number from that of the previous year.

SEX RATIO (Table 3)

Male/female ratio during past years varied between 0.21 (1977) to 1.41 (1971). Femles were more in number compared to males as has been reported by other workers (Spillet, Cohen and De 1966, Daniel 1967, Schaller 1967, Nair 1977) for other areas. Only in 1971 males outnumbered the females and in 1973 number of males and females were almost equal. The high ratio of males during that period corresponds with the high female mortality. Out of the 12 recorded deaths of females 8 died during that time. Notwithstanding the progressive increase in the population density of Blackbuck from 0.17/acre in 1967 to 1.58/acre in 1977, fawn/female ratio decreased from 1.5 in 1968 to only 0.11 in 1977. The two parameters show a significant negative correlation ($r = 0.644$, $P < 0.05 > 0.02$; Fig. 3). Such inverse relationship suggests that the progressive shrinkage of space has resulted into a lowering in the birth rate and that the population is approaching the carrying capacity.

BIRTH AND DEATH (Fig. 1, 2; Table 2)

Altogether 82 births have been recorded till the end of 1977 with a maximum of 15 births in 1973 and a minimum of 2 births in 1977. Although two peaks, one during March-April and another during October-December, can be noted with 20 and 30 births respectively, blackbuck gave birth to youngs all round the year. According to Schaller (1967) "The blackbuck has two birth seasons, the major one during the hot period and the other during the later part of the rains". The litter size varied from 1 to 2 individuals.

Turning to the death it is seen that maximum number of casualties were reported during 1973, when 7 individuals (1 male, 2 females and 4 fawns) died. Adult mortality was comparatively higher than infant mortality. During the entire period only 7 fawns died compared to the 15 male and 12 female death cases.

Out of the 34 deaths 13 remained undetermined since dead bodies decomposed to such an extent that a post-mortem was impossible. These were mostly fawns. Of the determined cases of deaths only 6 (3 males and 3 females) were due to old age. Other than this, highest toll was taken by heat stroke (2 males and 2 females). A casewise analysis of deaths are shown in Table 2.

Spotted Deer

POPULATION GROWTH (Table 1)

At the end of 1977 the population of spotted deer was found to be 58 individuals (25 males; 21 females and 12 fawns). The average annual growth rate of 5 individuals/year indicates the extraordinary power of increase. The adaptability of spotted deer into new habitat and the resultant explosion of population has been well illustrated by Graf and Nichols 1966, Ables and Ramsey 1972. The entire population growth pattern may be divided into two distinct phases. From 1968 to 1972, the growth was relatively slow. Altogether 17 births and 6 deaths have been recorded during that time (Fig. 4). During subsequent years, from 1973 to 1977, total recorded birth was 57 countered by only 14 deaths causing a rapid population growth. The initial lagphase may be attributed to the low population density and lower reproductive effort since population remained busy in establishing and acclimatizing itself within the new habitat. A slight depression in the population level in 1976, may well be related to the increased male mortality and emmigration of 5 individuals to the Salt Lake Deer Conservation Unit, Calcutta (Table 4).

SEX RATIO (Table 3)

There was little difference between numbers of males and females during past years except in 1971, when males were twice in number compared to females. Spillet and De (1966) also estimated a sex-ratio of 1 : 1 for spotted deer in Corbett National Park. Predominance of males during 1971 can be easily attributed to the high female mortality during 1970 and 1971.

As in blackbuck here also the increase in the population density from 0.17/ acre in 1968 to 0.96/acre in 1977 resulted into the decrease in fawn/female ratio (1.0 in 1968 to 0.57 in 1977). The relationship, however, was found to be statistically insignificant ($r = 0.15$, Fig. 5).

BIRTH AND DEATH (Fig. 4, Table 2)

In the last 10 years 74 birth were reported. The maximum and minimum incidences were recorded in 1975 (14 births) and between 1969 to 1971 (with 3 births per year) respectively. Spotted deer produced offsprings all round the year, with no indication of any definite peak. Lowest value has been obtained in the month of May (1 birth) and the highest figures in September and November (10 births each).

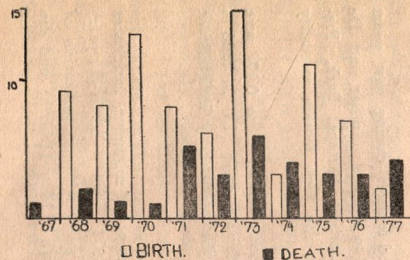


Fig. 1

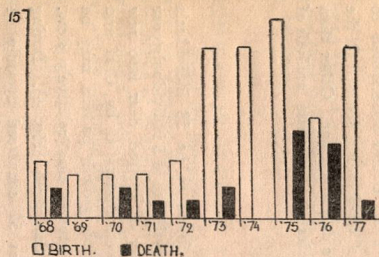


Fig. 4

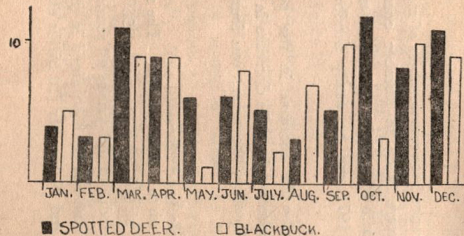


Fig. 2

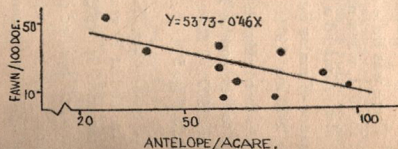


Fig. 3

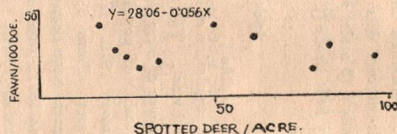


Fig. 5

Fig. 1. Yearwise incidence of birth and death/Year: Blackbuck.

Fig. 2. Monthwise incidence of birth.

Fig. 3. Regression correlation of Fawn/100 doe on Antelope/100 acre.

Fig. 4. Incidence of birth and death/year: Spotted Deer.

Fig. 5. Scatter diagram of Fawn/100 doe on Spotted Deer/100 acre,

Table 1

Population Size of Blackbuck and Spotted Deer (1967-1977)

Year	Blackbuck				Spotted Deer			
	Male	Female	Fawn	Total	Male	Female	Fawn	Total
1967	4	6	—	10	—	—	—	—
1968	2	6	9	17	4	4	2	10
1969	7	9	8	24	4	4	5	13
1970	10	12	14	36	5	4	5	14
1971	17	12	7	36	8	4	5	17
1972	16	17	6	39	9	9	2	20
1973	16	16	15	47	9	10	11	30
1974	19	24	3	46	15	12	15	37
1975	18	24	12	54	19	15	16	50
1976	21	30	7	58	22	18	7	47
1977	6	29	2	37	25	21	12	58

Table 2
Cause of Death : Blackbuck and Spotted Deer

Cause of death	Blackbuck				Spotted Deer			
	Male	Female	Fawn	Total	Male	Female	Fawn	Total
Old Age	3	3	—	6	2	—	—	2
Heat Stroke	2	2	—	4	—	—	—	—
Snake Bite	2	—	—	2	—	—	—	—
T.B.	1	—	—	1	—	—	—	—
Diarrohea	—	1	—	1	—	—	—	—
Hepatitis	—	—	1	1	—	—	—	—
Toxaemia & Chirosis	—	1	—	1	—	—	—	—
Strongyloides Infection	—	1	—	1	—	—	—	—
Other causes*	3	1	—	4	5	—	—	5
Cause undetermined	3	4	6	13	4	5	4	13
Total	14	13	7	34	11	5	4	20

*1. Succumbed to injuries, caused by the barbed fences while trying to escape from the park.

2. Mutual combat.

3. Accidental escape from the fences and eventual death due to heart failure, during running away restlessly and aimlessly.

4. Death due to the application of tranquiliser in over dose.

Table 3

Population Density, Sex Ratio and Fawn/Female Ratio of *Antilope cervicapra*
and *Axis axis*

1967	Blackbuck			Spotted Deer		
	Male/ Female	Fawn/ Female	Pop. Den- sity (Number Acres)	Male/ Female	Fawn/ Female	Pop. Den- sity (Number Acres)
1967	0.67	—	0.17	—	—	—
1968	0.37	1.50	0.28	1.00	1.00	0.17
1969	0.78	0.89	0.40	1.00	0.75	0.21
1970	0.84	1.16	0.60	1.25	0.75	0.24
1971	1.41	0.58	0.60	2.00	0.75	0.28
1972	0.94	0.35	0.65	1.00	0.45	0.34
1973	1.00	0.94	0.78	0.90	1.20	0.50
1974	0.79	0.13	0.76	1.25	1.00	0.61
1975	0.75	0.50	0.90	1.27	0.94	0.83
1976	0.70	0.24	0.97	1.23	0.39	0.78
1977	0.21	0.11	0.61	1.19	0.57	0.96

Table 4**Animals Received or Transported : Blackbuck and Spotted Deer**

	Date	Transported	Received	Remark
BLACKBUCK	10.9.67	—	4 M, 7 F	From Alipur Zoo, Calcutta
	2.7.71	2 M, 3 F	—	To Rewa
	28.10.71	—	2 M	From Nandan Kanan, Orissa
	12.8.76	1 M, 1 Fa	—	To Salt Lake Deer Park, Calcutta
	26.9.76	—	1 M, 1 F	From State Wild Life Officer, Calcutta
Total		3 M, 3 F, 1Fa;	7 M, 8 F	
SPOTTED DEER	21.2.68	—	4 M, 4 F	From Kankrajhora Deer Park, Midnapur
	28.10.71	—	1 F	From Nandan Kanan, Orissa
	12.8.76	1 M, 2 F	—	To Salt Lake Deer Park, Calcutta
	22.9.76	1 M, 1 F	—	-do-
Total		2 M, 3 F;	4 M, 5 F	
M — male, F — female, Fa — fawn.				

Out of the 20 incidents of reported death, the maximum death cases occurred in 1975 when 6 individuals died (5 males and 1 fawn). Post-mortem report is available only for 7 cases of death and reported causes of death are shown in the Table 4.

Conclusion

1. Both blackbuck and spotted deer are successfully breeding and considerably increasing in number under a semi captivated condition in Ballavpur Sanctuary.
2. Blackbuck population, with slower growth rate and higher mortality rate needs adequate care and proper management.

3. The populations are probably reaching carrying capacity of the deer park. This problem can be solved by proper habitat analysis and its manipulation alongwith an increase in the area of the Park.
4. From the conservation point of view at the present moment removal of the fencing seems to be undesirable and the Deer Park should be maintained as a semi-naturalistic system and can be best utilised by converting it into an "Antelope and Deer Research Center".

Acknowledgements

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United Nations Environment Programme

New Warnings on the Global Environment

The environment—defined as that outer physical and biological system in which man and other organisms live—is a whole, albeit a complicated one with many interacting components. The wise management of that environment depends upon an understanding of those components: of its rocks, minerals, soils and waters, of its lands and their present and potential vegetation, of its animal life and potential for livestock husbandry, and of its climate. It demands positive and realistic planning that balances human needs against the potential the environment has for meeting them.

This year, the Report of the Executive Director of the United Nations Environment Programme Dr. Mostafa Kamal Tolba (Nairobi, Kenya) focuses on four topics of broad international significance: schistosomiasis, resistance to pesticides, noise pollution and tourism. A brief Summary of these four 'emerging threats' is given here.

The Snail Scourge

Schistosomiasis, the debilitating disease which also goes under the names of bilharzia and snail-fever, has slowly and quietly spread to the point where it now casts its shadow over 600 million people in 72 countries and must be regarded as "a real social and economic scourge" says the UNEP report.

Ironically, development itself has paved the way for the advance of the disease. Thousands of dams and irrigation schemes, have provided wide new breeding grounds for the fresh-water snails which carry the schistosomiasis parasite. When humans also use these water sources for washing and sanitation, they complete a circuit through which the course of the disease begins to flow.

The symptoms of schistosomiasis are lethargy, lowered resistance, general ill-health, and in many cases, a slow and lingering death.

A break-through in the search for a vaccine against schistosomiasis 'cannot be expected before the year 2000' says the UNEP report. But in the meantime there are other weapons at hand. The cycle of the disease can be broken by improving water supply, sanitation, and public health education. The snails themselves can be attacked with chemicals or natural predators, such as the 'snail-cracker' fish, which has been successfully used in Puerto Rico. Most effective of all is the destruction of the snails' habitat. In China, where schistosomiasis afflicted more than 10 million people and depopulated whole villages, the disease has been almost eliminated by a national campaign. Millions of people participated, by draining infected canals, for example, and killing snails with sticks.

The Noise Menace

Next, the report turns its attention to noise pollution, which, says UNEP, "is escalating so rapidly as to become one of the major threat to the quality of human life".

From the air-tearing sound of the jet engine, to the distant rumble of industry noise has become an almost inescapable nuisance of modern life. But evidence is now accumulating to show that it is more than just a nuisance, for daily exposure can lead to the total silence of deafness.

There are now an estimated 500 separate occupations which are noisy enough to be a danger to hearing. Even under the maximum permissible noise level of 90 decibels for an eight-hour working day, stipulated by the United States government, one-fifth of the work force so exposed will suffer a disabling loss of hearing. In the Netherlands, the maximum permissible level has been reduced to 80 decibels and the UNEP report itself now states that "present knowledge indicates that an upper limit of 75 decibels would considerably reduce the risk".

Apart from deafness, noise can also cause temporary rises in blood pressure and heart rate and even ear, nose and throat disorders. Psychologically, the common symptoms of irritability, tension, moodiness, and fear may only be the tip of a largely uncharted ice-berg of noise consequences which may seriously affect human behaviour and relationships. At work, for example, the total cost of accidents, absenteeism, inefficiency and compensation claims due to high level of noise was estimated in 1971 in America at \$4 billion a year.

Efforts at legislation against the noise menace date back to ancient Rome when a law was passed to ban chariot racing at night. Now the World Health Organisation has drawn up environmental health criteria for noise pollution. But, says the report, measures to control noise ultimately depend on "public awareness of the effects of noise and public co-operation to control it".

Unguided Tours

The tourist may also be a mobile menace to the environment.

The actual number of international tourist arrivals has increased from 140 million in 1967 to 243 million by 1977 and is still increasing at about 4 per cent a year.

At first sight, this mass movement each year trails many advantages in its wake—especially for the developing countries who now welcome one international tourist in every eight. It earns money. It creates jobs. It gets airports and roads built. It gets water and electricity supplies installed. It can help to preserve historic sites and conserve wildlife—as well as giving a great deal of pleasure to a great many people. But there is also a backlash to the tourist boom. Socially, the tourist's presence—the way he dresses, eats, drinks,

spends and conducts himself—can create economic and even racial tensions and spark aspirations towards a life-style totally out of reach of the population of the developing country which he visits.

Environmentally, some of the world's most scenically beautiful and culturally significant places are being disfigured by the construction of roads, hotels, restaurants and shopping centres. "At best", says the UNEP report, the major tourists sites lose their attractiveness. At worst, major and often irreversible environmental damage will be caused".

Citing examples ranging from damaged historical sites in Greece and Britain to the pollution of marine ecosystems in the caribbean and the South Pacific, the report argues that striking a new balance is essential not only to prevent serious damage to our environment and heritage but also to preserve the pleasures and benefits of tourism itself.

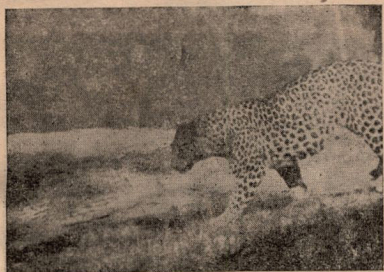
Pests Fight Back

The 1979 Environment Report turns finally to a more sinister problem. Agricultural production throughout the world has been dramatically increased by the use of billions of dollars-worth of pesticides to kill off crop-destroying insects, mites, ticks, fungi and rodents. At first, such pests reeled before this chemical onslaught. Now they are fighting back.

According to the UN Food and Agricultural Organisations latest survey, 364 species of insects and mites have now developed resistance to the pesticides being used against them. Among the major crops threatened by this new development, are cotton and rice—two of the principal cash and food crops of the developing world. At the same time, the World Health Organisation is reporting many different species of mosquito which can now survive DDT and Dieldrin attacks. One of the consequences is by now well known—a dramatic resurgence of malaria.

This rapidly widening resistance to the chemical armoury adds new urgency to research into other methods of pest control—sterilising male pest species and releasing them to mate unproductively, developing new strains of crops with built in pest-resistance, introducing other predators to keep the pest population down, and environmental management of the habitat and breeding grounds of the pests themselves.

"The danger of the situation" says the report, "is that there is reason to suppose that all pests are likely to be able to develop resistance to all types of chemical pesticide in time, with grave effects on both world health and world food production".



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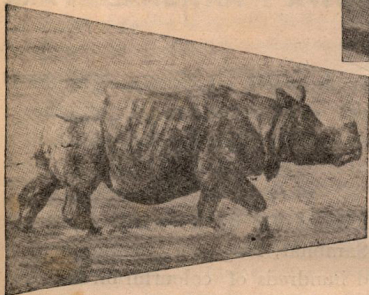
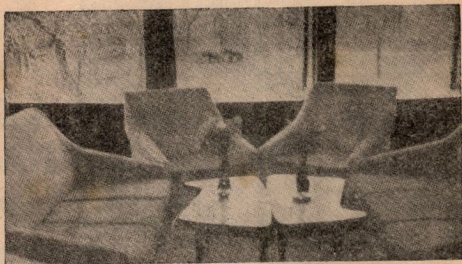
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1. The aims and objects of the Society are :—

- (a) To promote interest in and impart knowledge regarding the preservation and conservation of all forms of wildlife, particularly among the youth of the country
- (b) To co-operate with the Govts. of India and States and with other Societies and Institutions having similar aims and objects in working for the interests of wildlife
- (c) To assist in enforcing and actively supporting the Forest Acts, Wild Birds and Animals Protection Acts and Rules etc. of States and the Indian Arms Act and Rules in so far as they pertain to wildlife and to bring to the notice of the authorities any infringement of the same and to assist in the detection and prosecution of offenders in respect of such laws
- (d) To advise and help the Govt. and wildlife administrators in the formation, maintenance and protection of Sanctuaries and National Parks, the preservation of wildlife in general and rare species of India in particular and in the introduction of exotic species into the country, the rehabilitation of rare species etc. and in the revision on rational lines of the shooting and fishing rules, so as to conserve and increase wildlife stocks.
- (e) To raise funds for the carrying out of the above aims and objects and to found and maintain museums, reading rooms and libraries of natural history in order to disseminate knowledge regarding wildlife.
- (f) To promote sportsmanship in shikar and to recognise well regulated shooting and fishing, as a means of preserving wildlife and fish so that through wise use the surplus may provide a recreational asset to the nation.
- (g) To carry out publicity and propaganda for the preservation of wildlife in India by means of monographs, journals, films, film strips and other feasible methods.
- (h) To assist members of the Society in obtaining shooting and fishing facilities and facilities for viewing and photographing wildlife in India
- (i) To conduct research into the problem of Wildlife management in India, and in pursuance of this, to initiate, encourage and, where possible assist in projects for the study of threatened species and related subjects and to provide reference and research facilities for such work
- (j) To carry on such other activities which will serve the above subjects

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